BOLSTER SPRING SUSPENSION ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATIONS

This Application claims the benefit of Provisional U.S. Patent Application No. 60/482,956 filed 27 June 2003 by Howard E. Sellers.

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to a suspension system assembly for use with a leaf spring suspension system.

Discussion of the Prior Art

In vehicle suspension systems, the use of leaf springs and bolster springs is well known. For example one such use of a bolster spring is described in U.S. Patent Number 5,676,356 to Ekonen. Ekonen discloses a suspension system in which a leaf spring is carried by the undercarriage of the vehicle. A bolster spring is connected between each end of the leaf spring and the underlying end of the axles.

Another example of a vehicle suspension system that utilizes both a leaf spring and a bolster spring is described in U.S. Patent Number 6,079,723 to Choi. Choi discloses a suspension assembly for a vehicle having a leaf spring with a mounting block affixed to the end of the leaf spring. The mounting block is attached to a bolster spring, and the bolster spring is mounted to the vehicle frame with a bracket.

Both the Ekonen and Choi disclosures combine a leaf spring with a bolster spring to produce a suspension system that provides a smoother ride. However, in both of these

disclosures the bolster spring is an integral part of the overall suspension system and can not be easily added to the system as an aftermarket item. It would be desirable, however, to have a method of retrofitting or mounting a bolster spring to an existing leaf spring suspension system without having to completely redesign the entire suspension system.

In early developments leading up to the invention, a layered rubber bolster spring was substituted for the hanger arm at the rear of a leaf spring such that the bolster spring was compressed to accommodate the upwardly flexing of the leaf spring that occurs when the wheel goes over a bump. This, however, provided unsatisfactory results in that it did not control the jounce, or roll of the vehicle chassis in relation to the axle, as well as desired. In addition, it required substantial modification of the entire suspension system.

SUMMARY OF THE INVENTION

A bolster spring suspension assembly is disclosed in which a bolster spring is adapted for mounting to a vehicle between the axle and the undercarriage as a supplement to a second suspension element securing the axle to the vehicle.

One object of the invention is to provide an improved suspension system for providing a smoother ride. Another object of the invention is to provide a way to modify an existing leaf spring suspension to provide a smoother ride. A further object of the invention is to provide a suspension system that reduces jounce.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects of the invention will be apparent from the following description, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of the bolster spring suspension assembly;

FIG. 2 is a side view of the bolster spring suspension assembly under a normal load or downwardly flexed condition;

FIG. 3 is a sectional view of the bolster spring suspension assembly as seen from line 3-3 of FIG. 2;

FIG. 4 is a side view of the bolster spring in isolation from the other parts of the suspension assembly;

FIG. 5 is a cross sectional view of the bolster spring as seen from the line 5-5 of FIG. 6; and

FIG. 6 is a cross sectional view of the bolster spring as seen from the line 6-6 of FIG. 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a vehicle as partially shown in FIG's 1-4 includes a wheel 10 shown in broken line form for illustrative purposes mounted to an axle 12. The suspension system for the wheel includes a leaf spring 14 secured to a vehicle frame member 16 with a fixed mounting bracket 18 connected to one end of the leaf spring and a shackle 20 connected to the opposite end of the leaf spring and carried by a second mounting bracket 22 attached to the frame member. Axle 12 is secured to leaf spring 14 with a leaf spring support block 24 disposed between the leaf spring and the axle and a pair of U-bolts 26 on either side of the leaf spring fastened around the axle. The U-bolts 26 extend through the anchor plate 27 of a bolster spring suspension assembly 28 to secure the axle to the leaf spring 14. The opposite end 29 of suspension assembly 28 is secured to frame member 16 with bolts 44. End 29 of suspension assembly 28 is shown both laterally and vertically spaced from the opposite end with anchor

plate 27.

Suspension assembly 28 as shown in FIG. 5 includes a bolster spring 30 and mounting brackets 32, 34 secured to opposite ends of the bolster spring. Bolster spring 30 includes a plurality of resilient core members 36, separator plates 38 between adjacent core members, and end plates 40, 42 on either end of the bolster spring. Core members 36 and separator plates 38 are alternatingly stacked with each core laterally offset a similar distance from its adjacent core thereby forming an angularly disposed or diagonally oriented bolster spring 30. Resilient core members 36 are a rubber like substance that encase the metal plate separator plates 38. Separator plates 38 are preferably cupped or have indentions 46 in the core area to provide resistance to shear forces exerted parallel to the plane of the separator plates, as best seen in FIG's. 5 and 6. Bolster spring 30 is known in the art and is preferably of the type distributed under the trade name HMX BOLSTER SPRING KIT by Hendrickson International Truck Suspension Systems located in Woodridge, Illinois, but other similarly constructed bolster springs could also be used. Mounting bracket 32 includes anchor plate 27 which is adapted to be clamped over leaf spring 14 with U-bolts 26. End 29 of mounting bracket 34 is adapted to be attached to frame member 16 with bolts 44.

As best shown in FIG. 2, mounting brackets 32, 34 are adapted such that bolster assembly 28 may be mounted over axle 12 between frame member 16 and leaf spring 14 with separator plates 38 positioned essentially vertically and bolster spring 30 extending toward mounting bracket 18 and upwardly from axle 12, or generally diagonally, between mounting bracket 32 and mounting bracket 34. The angle of separator plates 38 with respect to vertical affects the resulting ride and jounce control of the vehicle. As the plates approach the vertical, the ride becomes smoother, but jounce is controlled less and the carrying capacity decreases. As the

plates deviate from the vertical, jounce is controlled more and carrying capacity increases, but the ride becomes less smooth. In the preferred embodiment for a class 7 chassis, plates 38 are positioned between approximately 5° and 25° from the vertical to produce both a smooth ride and provide substantial jounce control. In this position and location, bolster spring 30 may deform in both shear and compression when axle 12 is urged generally upwardly with respect to frame member 16 as illustrated by arrow 33 shown in FIG. 3. The majority of the deformation of bolster spring 30 is in shear caused by the vertical movement of axle 12. A significantly smaller amount of compressive deformation in bolster spring 30 may be caused due to other various forces. In addition, a small compressive deformation in bolster spring 30 may be caused by the rotation of bracket 32 about mounting bracket 18 as leaf spring 14 is flexed upwardly. In this configuration, bolster spring 30 will be engaged immediately upon any vertical shifting of axle 12 with respect to the frame 16.

Bolster spring suspension assembly 28 may be either installed as original equipment or easily retrofitted or attached to an existing leaf spring suspension system. When retrofitting suspension assembly 28 to an existing leaf spring suspension, the original mounting brackets for U-bolts 26 are removed and appropriate holes for bolts 44 are formed in frame member 16. A backing plate 48, best seen in FIG. 3, is preferably fastened to the side of frame member 16 opposite mounting bracket 34 with bolts 44 in order to compensate for additional stresses imparted on the frame by the bolster spring suspension assembly. Backing plate 48 is adapted to have holes (not shown) for accepting each bolt 44, and is preferably the same shape as end 29 of bracket 34 for simple manufacture. Assembly 28 is then mounted as shown and previously described by securing U-bolts 26 to anchor plate 27 and securing bracket 34 to frame 16.

The description given herein is not considered to be a limitation on other minor and

obvious variations, but is only meant to exemplify and encompass the full scope of the invention as set forth in the claims.